TWO *LOBELIA* (CAMPANULACEAE) GYPSOPHILES FROM NUEVO LEÓN, MÉXICO

TINA J. AYERS

L. H. Bailey Hortorium
467 Mann Library, Cornell University, Ithaca, NY 14853-4301, U.S.A.

ABSTRACT

The taxonomy of two gypsum endemics, *Heterotoma pringlei* and *Lobelia margarita*, is discussed and their relationship clarified. *Heterotoma pringlei* is transferred to *Lobelia*, "series *Angustifolia*," requiring a new name, for which **L. gypsophila** is proposed. A key, descriptions, distributions, and illustrations are provided for both species.

A recent monographic study of the genus *Heterotoma* Zucc. (Ayers 1986) revealed that two species occur only on gypsum outcrops in Nuevo León, México, and are closely related. The species are allopatric, the closest populations separated by approximately 40 miles. They have been treated as conspecific (McVaugh 1943) and as species of different genera (Wimmer 1953). Field, herbarium, and micromorphological studies have revealed many unique characteristics common to both. The presence of these characteristics argues that, although the taxa deserve specific recognition, they should not be segregated in separate genera.

Heterotoma pringlei B. L. Robinson (1909) was described from a single collection (*Pringle 13274*) reported to possess calyces "3−4 mm longo valde gibboso." Gibbose hypanthia or nectar spurs are the single criterion delimiting *Heterotoma* Zucc. sensu lato from *Lobelia* L. McVaugh (1943) broadened the species (and the generic) concept to include plants with hypanthia "varying to regular or essentially so." Wimmer (1948) described the plants with regular hypanthia as a new species of *Lobelia*, *L. margarita*, which he included in his "series *Angustifolia*." Wimmer (1953) continued to recognize *Heterotoma pringlei*, still known only from the type, by its "oblique-oblong" hypanthium.

With the continuing exploration of the Sierra Madre Oriental in southeastern Nuevo León, numerous recent collections have documented the existence of two distinct species. Both are perennials that produce basal rosettes and flowering shoots from a woody rootstock. They are nearly identical vegetatively, but may be separated easily by floral morphologies unique among Mexican lobeliads. *Heterotoma pringlei* can be recognized by its hypanthium, which appears asymmetrical because the pedicel is

SIDA 13(2):141−148. 1988.

attached at the top of the hypanthium and the extension of corolla tissue forms a nectar spur (Fig. 1B). A non-median pedicel attachment is unusual in lobeliads and is found only rarely, as in the Australian *Lobelia gibbosa* Labill., in which the pedicel attaches to the lower side of the hypanthium. *Lobelia margarita* has a regular hypanthium, but the corolla tube diverges upward at a 45° angle creating a "pouch" on the lower side at the base of the corolla tube (Fig. 1C). Corolla tubes of lobeliads are often slightly longer on the lower side (and the hypanthium subsequently slightly shorter), but the corolla tube usually lies in the same plane as the hypanthium.

To my knowledge both of these gypsophiles are unique among Mexican lobeliads in their pedicellar movement during fruit maturation. The pedicel deflexes abruptly at the hypanthium and the fruit is pendant with the "gibbose" or lower side closest to the stem axis (Fig. 1). In almost all other species, the fruit remains stationary or the pedicel reflexes near the hypanthium so that the fruit is presented above the pedicel with the lower side oriented away from the stem axis or upward.

In addition to soil preferences, vegetative features, and pedicellar movement during fruit maturation, a variety of macro and micromorphological characters supports the hypothesis that the two taxa are more closely related to one another than to other Mexican species of *Lobelia*. The pollen exine in both taxa is reticulate with lumina 0.3 − 0.5 m in diameter (Ayers 1986), similar to the exine of *Isotoma fluviatalis* F. Muell. (Dunbar 1984). Pollen exine of all other species of Mexican lobeliads studied was reticulate-striate with lumina 0.1 − 0.25 um in diameter (Ayers 1986). Seed testa sculpturing of both *Heterotoma pringlei* and *Lobelia margarita* are sinuo-striate (Ayers in prep.), a unique condition not observed in any other species studied. In addition to the unusual sculpturing, both species have seeds that are slightly smaller than average (0.3 vs 0.5 mm long) and unusually colored (burgundy red vs tan to dark brown).

The number of unique characteristics shared by the two gypsophiles argues that despite the differences in hypanthium morphology, they should not be placed in separate genera. In a recent delineation of *Heterotoma* (Ayers 1986), the genus has been restricted to include only the generotype, *H. lobelioides*. The remaining species are referred to *Lobelia* (Ayers 1987 & in prep). *Heterotoma pringlei* is here transferred to *Lobelia* as *L. gypsophila*.

Lobelia gypsophila may be referred to Wimmer's "series *Angustifolia*," an artificial group delimited by the presence of small corollas (5 − 12 mm long) and narrow leaves. Wimmer placed 24 African and Australian species and seven New World species (six Mexican including *L. margarita*)

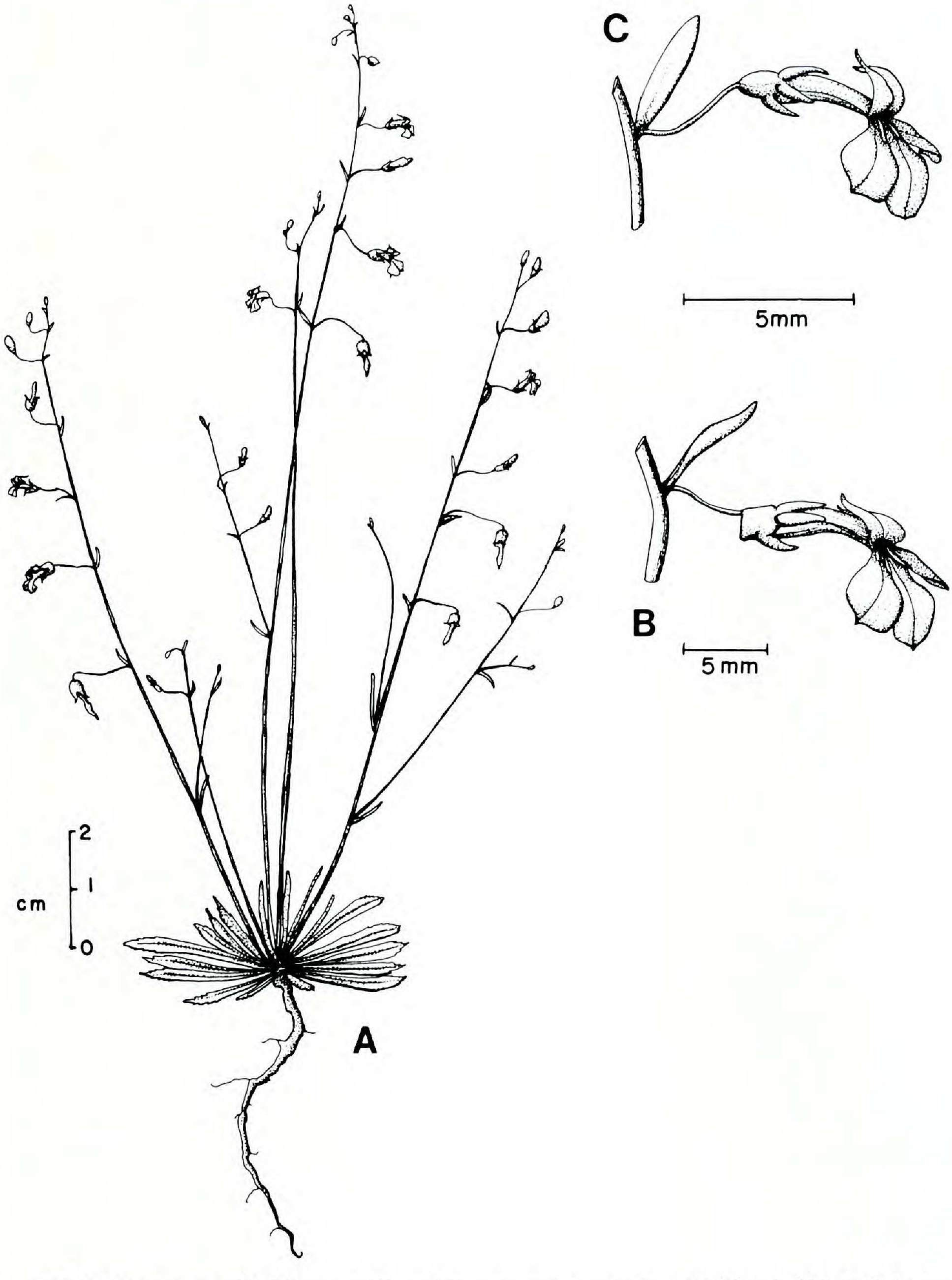

FIG. 1. Illustration of *Lobelia gypsophila* and *L. margarita*. A – B: *L. gypsophila*. A. Habit. B. Lateral view of flower. C. *L. margarita* lateral view of flower.

in the group. An additional Mexican species, *Lobelia henricksonii* M. C. Johnston, was tentatively referred to the group as well (Johnston 1982). *Lobelia trivialis* F. Wimmer, the only lobeliad species sympatric with both gypsum endemics, occurs on sandy alluvium. Although L. trivialis was also placed in "series *Angustifolia*," it is an annual with minute flowers and not thought to be related to the gypsophiles. Possible relatives of the gypsophiles might include the perennial, woody-based *L. henricksonii* and *L. pringlei* S. Wats. although this feature may be adaptive to the arid regions they inhabit.

The two *Lobelia* gypsophiles may be separated by the following key:

1. Stems usually simple from a basal rosette; hypanthia asymmetrical, truncate at base; pedicels attaching to top of ovary (Fig. 1A-B) . . 1. *L. gypsophila*
1. Stems often branching above basal rosette; hypanthia symmetrical, rounded at base; pedicels attaching to middle of ovary (Fig. 1C) . . . . . 2. *L. margarita*

1. LOBELIA **gypsophila** Ayers, nom. nov. (Fig. 1). *Heterotoma pringlei* B. L. Robinson, Proc. Amer. Acad. Arts 44:615. 1909. non *L. pringlei* S. Wats. 1890.—TYPE: MÉXICO. NUEVO LEÓN: chalky mountains near Doctor Arroyo, 7 Nov 1904, *C. G. Pringle 13274* (HOLOTYPE: GH!; ISOTYPES: F!, MICH!, MO!, US!).

Herbaceous perennials 12 − 25 cm tall, from woody persistent root-stocks. Stems erect from basal rosettes, glabrous, waxy, tinged with purple. Leaves mostly basal, considered sessile without a distinct petiolar junction; rosulate leaves spatulate, 5 − 30 mm long, 1 − 2.5 mm wide, attenuate at base, acute at apex, the margins somewhat undulate with 2 − 4 pair of teeth; cauline leaves narrowly oblanceolate to linear, usually much reduced, entire, all leaves glabrous, with a thick waxy cuticle, green above, purple below. Inflorescences of strongly secund, 5 to 15-flowered racemes; bracts linear, 2 − 10 mm long, ca 1 mm wide, green or tinged with purple, glabrous; lower pedicels 6 − 10 mm long, much reduced above, diverging at right angles from stem, glabrous; bracteoles absent. Flowers 4.5 − 6.5 mm long (including hypanthium); hypanthium asymmetrical, oblong, 2.5 − 4.0 mm long, truncate at base, appearing gibbose due to pedicelar attachment at top; spurs 2.0 − 2.5 mm long (measured from base of upper calyx lobes), extending 1.0 − 1.5 mm below lower calyx lobes; calyx lobes subulate, 1.0 − 1.2 mm long, green, purple margined, appressed or slightly spreading, the two lower lobes slightly shorter than upper three, positioned 0.5 − 1.5 mm below the hypanthium rim; corolla white to lavender with the upper portions often more deeply pigmented, the tube 2 − 4 mm long, slit dorsally to within 1 mm of base, the upper corolla lobes narrowly triangular, 2 − 4 mm long, ca 0.8 mm wide, reflexed and often crossed above anther tube at anthesis, lower lobes

narrowly obovate, slightly spreading, 3 – 5 mm long, 1 – 3 mm wide, obtuse, with two small circular green spots on white ridges opposed to sinuses at throat; stamens 2.5 – 3.0 (– 4.0) mm long, the filaments white, ciliate at base, connate in the distal half, the anthers ca 1 mm long, blue, appearing exerted above dorsal slit by a reflexed corolla tube, minutely cannescent with longer trichomes along sutures, the two lower anthers with a triangular flap and numerous short bristles at apex. Fruit turbinate, 2.5 – 3.0 mm long, 1.0 – 1.5 mm wide, pendant by a sharp bending of the pedicel at the hypanthium, rarely the pedicel twisted 180° and the spur side of flower proximal to the pedicel. Seeds numerous, burgundy-red, ovoid, ca 0.3 mm long, shiny, the testa appearing faintly lined to the naked eye.

DISTRIBUTION (Fig. 2): On heavily eroded gypsum outcrops in juniper-oak woodland on the western side of Cerro Peña Nevada and neighboring ranges in extreme s.e. Nuevo León at 2000 – 3500 m. Flowering: July to November.

Representative specimens: MÉXICO. **Nuevo León**: 4.3 mi NE of San Antonio Peña Nevada on road to Zaragosa, 10 Oct 1984, *Ayers & Scott 480* (TEX); 3.7 mi N of Zaragosa on road to Aramberri, 10 Oct 1984, *Ayers & Scott 508* (TEX); ca 30 km ENE of Dr. Arroyo, 2.5 km ENE of San Antonio Peña Nevada, 3 Aug 1981, *Nesom 4284* (TEX); 3 mi N of Zaragosa, just above Cuesta Blanca, 28 Sep 1983, *Nixon 4039* (TEX); 8.6 mi S of Aramberri on road to Zaragosa, 20 Oct 1979, *Warnock 2042* (TEX); ca 7 km NE of San Antonio Peña Nevada, Jul 1977, *Wells 505* (LL).

2. LOBELIA MARGARITA F. Wimmer, Ann. Naturhist. Mus. Wien. 56:355. 1948.—TYPE: MÉXICO. NEUVO LEÓN: Mpio. Galeana, Hacienda Pablillo, 14 Aug 1936, *M. Taylor* 167 (HOLOTYPE: F!; ISOTYPE: TEX!).

Herbaceous perennials, 15 – 32 cm tall, from woody persistent rootstocks. Stems erect from a basal rosette, glabrous, waxy, tinged with purple. Leaves mostly basal, considered sessile without a distinct petiolar junction; rosulate leaves spatulate, 0.5 – 50 mm long, 0.2 – 2.5 mm wide, decurrent at base, acute at apex, the margins somewhat undulate with 2 – 6 pair of teeth, cauline leaves linear, usually much reduced, entire, all leaves glabrous with a thick waxy cuticle, green above, purple below. Inflorescence of strongly secund, 10 to 20-flowered racemes; bracts linear, 4.5 – 12 mm long, ca 1 mm wide, green or tinged with purple, glabrous; lower pedicels 8 – 12 mm long, much reduced above, diverging at right angles from stem, glabrous; bracteoles absent. Flowers 4.5 – 6 mm long (including hypanthium); hypanthium cylindrical, 1 – 1.5 mm long, rounded at base; calyx lobes subulate, 1 – 1.2 mm long, green, purple margined, appressed or slightly spreading, the two lower lobes

positioned ca 0.2 mm below hypanthium rim at base of the spur-like corolla pouch; corolla white to lavender with the upper portions often more deeply pigmented, the tube 1.8 – 2 mm long, slit dorsally to within 0.5 mm of base, appearing gibbose by a spur-like pouch at base of ventral side of tube, the upper corolla lobes narrowly triangular, ca 2 mm long, ca 0.5 mm wide, reflexed at anthesis, lower lobes narrowly obovate, slightly spreading, 1.5 – 2 mm long, ca 1 mm wide, obtuse, with two small circular green spots on white ridges opposed to sinuses at throat; stamens 2 mm long, the filaments white, ciliate at base, connate in the distal half, the anthers ca 1 mm long, blue, appearing exerted above dorsal slit by a reflexed corolla tube, minutely cannescent with longer trichomes along sutures, the two lower anthers with a triangular flap and numerous short bristles at apex. Fruit subglobose, ca 2 mm long, 1 – 1.5 mm wide, pendant by a sharp bending of the pedicel at the hypanthium, rarely the pedicel twisted 180° and the lower side of the flower proximal to the pedicel. Seeds numerous, burgundy-red, ovoid, ca 0.3 mm long, shiny, the testa appearing faintly lined to the naked eye.

DISTRIBUTION (Fig. 2): On heavily eroded gypsum outcrops in juniper-pine woodland on slopes of Cerro Potosí and foothills near Galeana at 1845 – 2100 m. Flowering: (May) July to October.

Representative specimens: MÉXICO. **Nuevo León**: Mpio. Galeana: 2.2 mi above Dieciocho de Marzo on road to microwave station and top of Cerro Potosí, 14 mi N of Galeana, 8 Oct 1984, *Ayers & Scott 455* (TEX); cliffs of dry arroyo, 3.2 mi S of Galeana, 9 Oct 1984, *Ayers & Scott 459* (TEX); 2 km W of Rincón de San Antonio, ca 6 mi N of Pablillo off Pablillo-Galeana highway, 9 Oct 1984, *Ayers & Scott 461* (TEX); dry face of clay wall in arroyo, 29 Jul 1939, *Chase 7638* (GH); Low gypsum hills S of Cerro Potosí, ca 2 mi N of Ejido Santo Domingo, ca 7 mi NE of San Roberto Junction, 24 Oct 1982, *Dorr, et al. 2545* (TEX); El Potosí, 13 Jan 1981, *Hinton, et al. 18101* (TEX); 10 km E of Las Norias, 19 Jul 1984, *Hinton, et al. 18746* (TEX); 2.5 mi S of Pueblo Galeana near junction of road to Linares, 6 Aug 1965, *Irving 150* (TEX); 11 km by winding road east of Tokio on the San Roberto-Galeana highway, 17 May 1973, *Johnston, et al. 11054b* (LL); Cerro Potosí, west base, ca 3 mi up road from 18 de Marzo, 12 Oct 1984, *Lavin & Sundberg 5239* (TEX); calcite and limestone hills beyond Pablillo toward Santa Clara, about 15 mi SW of Galeana, 18 Jul 1934, *Mueller & Mueller 1061* (F, GH, TEX); near town of La Laguna ca 4 mi W of Galeana, ca 1.6 mi S of lake in view of town, 19 Jun 1987, *Nesom, et al. 6215* (TEX); Santa Rita de Cordelada, gypsum hills to the south of Cerro Potosí accessible from Hwy 57; ca 10 km NNE of San Roberto junction, 24 Oct 1982, *Nixon, et al. 3792* (TEX); ca 11 km NW of Galeana on road to San Lucas, 16 May 1981, *Poole, et al. 2306* (TEX); 12.6 mi E of San Roberto Junction toward Linares, 26 Sep 1970, *Turner 6226* (TEX); NE lowermost slope of Cerro Potosí, along road to microwave station, ca 12 mi NW of Galeana, 20 Aug 1979, *Turner & Davies A-17* (TEX); 3.2 mi S of Galeana, 10 Oct 1985, *Turner, et al. 15561* (TEX); 6.9 mi N of galeana on dirt road to San Lucas, 10 Oct 1985, *Turner, et al. 15571* (TEX); 1.6 mi N of Galeana on S facing gypsum hillside, 10 Oct 1985, *Turner, et al. 15591* (TEX).

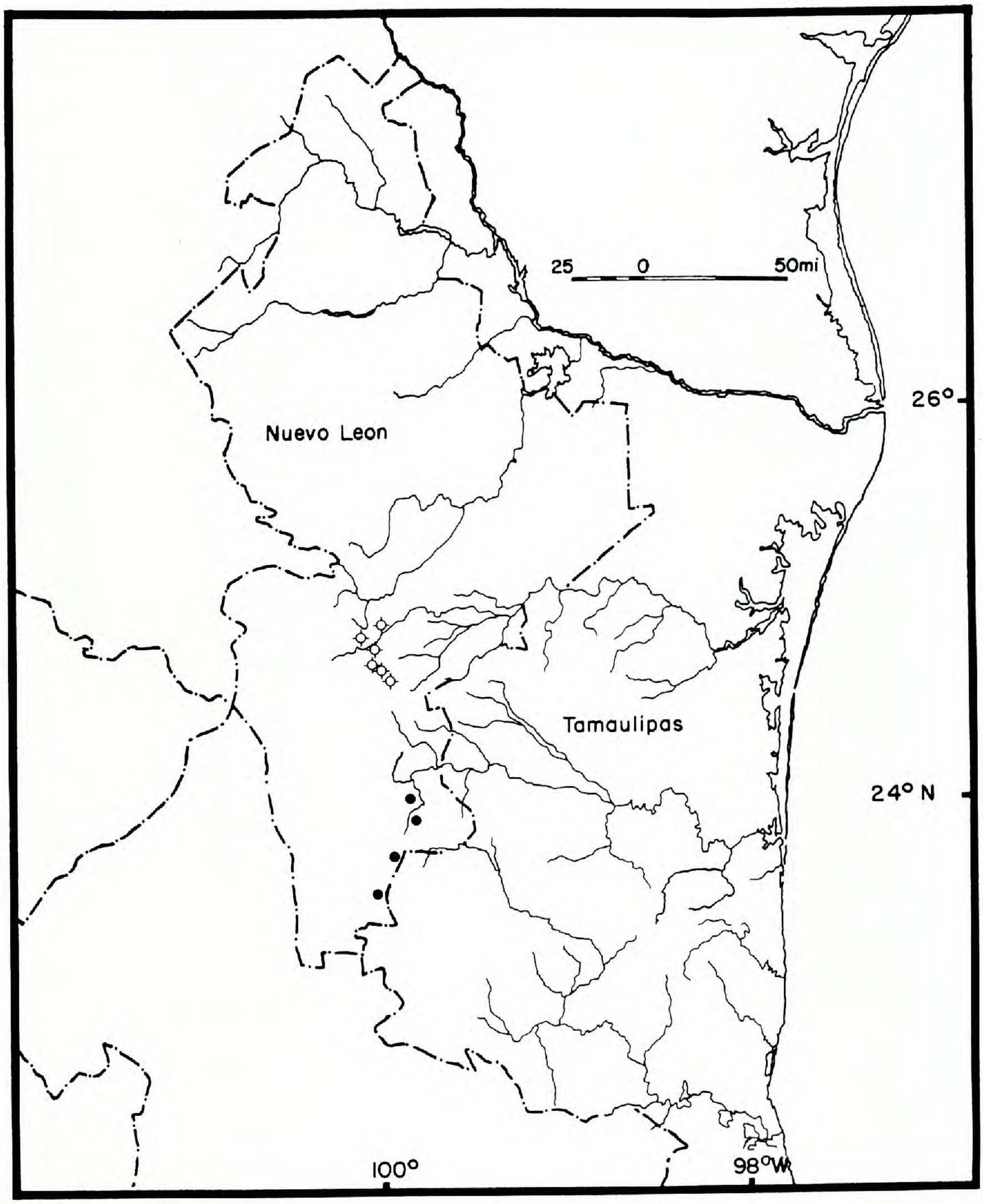

FIG. 2. Distribution of *Lobelia gypsophila* (●) and *L. margarita* (⊹) in Nuevo León, México. Each dot may represent more than one collection.

ACKNOWLEDGEMENTS

I thank the curators of F, GH, MICH, MO and TEX for the use of their specimens. Randall Scott and Billie L. Turner were invaluable field companions. Katie Bear prepared the illustration and James Henrickson reviewed an earlier draft of this paper.

REFERENCES

AYERS, T. J. 1986. Systematics of *Heterotoma* Zucc. (Campanulaceae: Lobelioideae). Ph.D. Thesis. Univ. of Texas, Austin.

———. 1987. Four species from western México new to *Lobelia* (Campanulaceae: Lobelioideae). Brittonia 39:417–422.

DUNBAR, A. 1984. Pollen morphology of Campanulaceae IV. Nordic J. Bot. 4:1–19.

JOHNSTON, M. C. 1982. Two new taxa of *Lobelia* (Campanulaceae) from the Chihuahuan desert region of México. Nordic J. Bot. 2:1–4.

MCVAUGH, R. 1943. Campanulaceae, Lobelioideae. N. Am. Fl. 32A:1–134.

WIMMER, F. E. 1948. Vorarbeiten zur Monographie der Campanulaceae-Lobelioideae: II. Trib. Lobelieae. Ann. Naturhist. Mus. Wien. 56:317–374.

———. 1953. Campanulaceae-Lobelioideae. II. Teil. Pflanzenr. IV. 276b(Heft 107):261–814.